

CLAIMS

1. (Canceled)
2. (Currently Amended) The method of claim 11, wherein the inter-layer relationships include at least one of content related information, user interest in an associated topic, and user interest in an associated Web page.
3. (Currently Amended) The method of claim 11, wherein the intra-layer relationships include at least one of query refinement, recommended Web page, and relationship between respective users.
4. (Currently Amended) The method of claim 11, wherein each of the multi-type data objects are related to at least one of ~~a search query data object type~~, a selected Web page type~~[[,]]~~ and a user information type.
5. (Currently Amended) The method of claim 11, wherein the inter-layer relationships include a first weighting scheme and the intra-layer relationships include a second weighting scheme different than the first weighting scheme to indicate importance to associated objects of the multi-type data objects.
6. (Currently Amended) The method of claim 11, wherein the identifying and the iteratively clustering are performed for the suggested search terms suggestions.

7. (Currently Amended) The method of claim 11, wherein the iteratively clustering comprises propagating clustering results of a first iteration to all related data objects of the multi-type data objects, at least two of the related data objects being of heterogeneous data type, the propagating being used to enhance clustering of respective ones of the multi-type data objects in a second iteration of reinforced clustering operations.

8. (Currently Amended) The method of claim 11, wherein the iteratively clustering comprises determining a similarity between individual ones of the multi-type data objects, the similarity being a function of at least one of inter-object and intra-object content similarity and similarities between the inter-layer relationships and the intra-layer relationships.

9. (Currently Amended) The method of claim 11, wherein the iteratively clustering comprises merging related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

10. (Currently Amended) The method of claim 11, wherein the method further comprises mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types.

11. (Currently Amended) A computer-implemented method performed by a computing device that has one or more processors to execute instructions, the method comprising:

identifying relationships between multi-type data objects that include at least one object of a first type and at least one object of a second type different from the first type, the relationships being at least one of intra-layer relationships or inter-layer relationships among the multi-type data objects-based-on-user-interaction-with-the-multi-type-data objects;

iteratively clustering the multi-type data objects based on the relationships to generate reinforced clusters;

generating a list of suggested search terms associated with a bid term using the reinforced clusters, the search terms generated in response to receiving the bid term from a user;

storing-transmitting, via a network interface, the list of suggested search terms to a user-on-a-computer-readable-storage-media; and

mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types based on the following:

$$\left\{ \begin{array}{l} a(X) = \beta L_X^T h(X) + (1 - \beta) L_{XY} i(Y) \\ h(X) = \beta L_X a(X) + (1 - \beta) L_{XY} i(Y) \\ i(X) = a(X) + h(X) \\ \\ a(Y) = \gamma L_Y^T h(Y) + (1 - \gamma) L_{YX} i(X) \\ h(Y) = \gamma L_Y a(Y) + (1 - \gamma) L_{YX} i(X) \\ i(Y) = a(Y) + h(Y) \end{array} \right.$$

wherein $X = \{x_1, x_2, \dots, x_m\}$ and $Y = \{y_1, y_2, \dots, y_n\}$ represent respective object sets of heterogeneous object type with relationships R_X , R_Y , R_{XY} and R_{YX} if directionality is considered, L_X and L_Y represent adjacent matrixes of links identifying relationships within set X and Y respectively, L_{XY} and L_{YX} represent adjacent matrixes of links identifying relationships from objects in X to objects in Y , $a(X)$ and $h(X)$ are an authority score and a hub score of nodes within X respectively, $a(Y)$ and $h(Y)$ respectively represent authority scores and hub scores of nodes in Y , $i(X)$ and $i(Y)$ respectively represent an importance of the nodes in X and Y , and β and γ are weight parameters to adjust influence of links derived from different relationships.

12. (Currently Amended) The method of claim 11, ~~wherein the utilizing the reinforced clusters comprises~~ further comprising:

~~responsive to receiving the bid term from a user,~~

comparing the bid term with a feature space of objects in the reinforced clusters to identify the suggested search terms[;:]

~~responsive to the comparing, identifying one or more search term suggestions;~~

and

~~communicating the search term suggestions to the user.~~

13-22. (Canceled)

23. (Currently Amended) The computer-readable storage medium of claim [22]]32, wherein the inter-layer relationships comprise at least one of content related

information, user interest in an associated topic, and user interest in an associated Web page.

24. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the intra-layer relationships comprise at least one of query refinement, recommended Web page, and relationship between respective users.

25. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein each of the multi-type data objects are related to at least one of a search query data object type, a selected Web page type, and a user information type.

26. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the at least one of the identified relationships are weighted to indicate an importance to associated objects of the multi-type data objects.

27. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the identifying and the iteratively clustering are performed for the suggested search term-suggestion.

28. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the iteratively clustering comprises propagating clustering results of a first iteration to all related data objects of the multi-type data objects, at least two of the related data objects being of heterogeneous data type, the propagating being used to

enhance clustering of respective ones of the multi-type data objects in a second iteration of reinforced clustering operations.

29. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the iteratively clustering comprises determining a similarity between individual ones of the multi-type data objects, the similarity being a function of at least one of object content similarity and similarities between the at least one of the identified relationships.

30. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the iteratively clustering comprises merging related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

31. (Currently Amended) The computer-readable storage medium of claim [[22]]32, wherein the instructions further comprise instructions for mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types.

32. (Currently Amended) A computer-readable storage medium comprising computer-executable instructions executable by a processor for:

identifying at least one of intra-layer and inter-layer relationships among multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type;

iteratively clustering the multi-type data objects by at least one of the relationships to generate reinforced clusters;

generating a list of suggested search terms associated with a bid term using the reinforced clusters, the suggested search terms generated in response to receiving the bid term from a user; and

mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types based on the following:

$$\begin{cases} a(X) = \beta L_X^T h(X) + (1 - \beta) L_{XY} i(Y) \\ h(X) = \beta L_X a(X) + (1 - \beta) L_{XY} i(Y) \\ i(X) = a(X) + h(X) \\ a(Y) = \gamma L_Y^T h(Y) + (1 - \gamma) L_{YX} i(X) \\ h(Y) = \gamma L_Y a(Y) + (1 - \gamma) L_{YX} i(X) \\ i(Y) = a(Y) + h(Y) \end{cases}$$

wherein $X = \{x_1, x_2, \dots, x_m\}$ and $Y = \{y_1, y_2, \dots, y_n\}$ represent respective object sets of heterogeneous object type with relationships R_X , R_Y , R_{XY} and R_{YX} if directionality is considered, L_X and L_Y represent adjacent matrixes of links identifying relationships within set X and Y respectively, L_{XY} and L_{YX} represent adjacent matrixes of links identifying relationships from objects in X to objects in Y , $a(X)$ and $h(X)$ are an authority score and a hub score of nodes within X respectively, $a(Y)$ and $h(Y)$ respectively represent authority scores and hub scores of nodes in Y , $i(X)$ and $i(Y)$ respectively represent an importance of the nodes in X and Y , and β and γ are weight parameters to adjust influence of links derived from different relationships.

33. (Currently Amended) The computer-readable storage medium of claim ~~[[22]]~~32, wherein the instructions further comprise utilizing the reinforced clusters comprises:

~~responsive to receiving the bid term from a user;~~
comparing the bid term with a feature space of objects in the reinforced clusters
to identify the suggested search terms[;]
~~responsive to the comparing, identifying one or more search term suggestions;~~
and
~~communicating the search term suggestions to the user.~~

34-40. (Canceled)